open Ciſtern of the other. The Parts thus diſpos'd, and the Stop-cock being turn'd, the Condens'd Air proceeds ſtrongly thro the Swan-neck Pipe, which diſcharges it into the Horizontal Tube .G. Whoſe Currency ſo leſſens the Preſſure of the Atmoſphere upon the Ciſterns of the reſpective Barometers as to cauſe the Mercury to deſcend 2 inches at leaſt. And 'tis obſervable, That that Barometer which is 3 foot diſtant from the Current Air is equally affected, and ſubſides parallel with the other. Likewiſe it is to be noted, that as the Current Air is weakned in its force, ſo doth the Weight of the Atmoſphere again Encreaſe, and the Mercury in the Barometers gradually Aſcend.

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III. *An Account of ſome Eclipſes of the Sun and Moon, obſerved by Mr* Tho. Brattle, *at* Cambridge, *about four miles from* Boſton *in* New-England, *whence the Difference of Longitude between* Cambridge *and* London *is determin'd, from an Obſervation made of one of them at* London. *By* J. Hodgſon.

ON the 12th of *June* 1694. in the morning I went to the Colledge at *Cambridge*, about 4 miles from *Boſton*, and obſerved, with the Braſs Quadrant there, with Telleſcopick Sights, the Rays of the Sun being tranſmitted through one of the ſaid Sights, on a clean Paper, paſted on a plain piece of Board, and faſtned at right angles at about a foot diſtance from the ſaid Sight, on which Paper I had drawn a Circle between 2 and 3 Inches Diameter equal to the Suns diſk, and within that ſeveral Concentrick Circles dividing the Diameter into 24 equal

equal parts, whereby I could obſerve to ½ a digit, the room in which the Obſervation was made was darkened with Blankets, and in order to render the Obſervation the more Exact (Mr *Henry Newman* aſſiſting me all the while) I took the Altitude of the Sun with the aforeſaid Quadrant, as followeth.

Obſervations made of the Suns Altitude before the Eclipſe began, in order to rectifie the Watch.

| By the Watch | | | | Comp. Altit. | | | Time by Calcul. | | differ. |
|---|---|---|---|---|---|---|---|---|---|
| | h | ′ | ″ | | | | | | |
| at | 8 | 26 | 37 | 49 | 31 | 8 | 16 | 40 | 9 57 |
| | | 31 | 27 | Mane 48 | 26 | | 21 | 40 | 9 47 |
| | | 38 | 26 | 47 | 20 | | 28 | 32 | 9 54 |

The Eclipſe was firſt perceiv'd at h ′ 9 25 by the Watch, at which time the Sun had ſcarcely been eclips'd 1 minute, ſo that

| By the Watch | | | True time. | | |
|---|---|---|---|---|---|
| | h | ′ | h | ′ | |
| | 9 | 24 | 9 | 14 | It began |
| | 9 | 32 | 9 | 22 | about 1 digit eclipſed |
| | 9 | 48 | 9 | 38 | full 3 digits |
| | 9 | 57¾ | 9 | 48 | about 4 |
| | 10 | 06 | 9 | 56 | near 5 |
| | 10 | 15 | 10 | 05 | full 6 |
| | 10 | 33 | 10 | 23 | about 8 |
| At | 10 | 43 | 10 | 33 | full 9 |
| | 10 | 47 | 10 | 37 | full 9½ |
| | 10 | 53 | 10 | 43 | full 10 |
| | 10 | 59 | 10 | 49 | about 10½ |
| | 11 | 03 | 10 | 53 | better than 10½ |
| | 11 | 06 | 10 | 56 | much the ſame |
| | 11 | 09 | 10 | 59 | rather decreaſing |

By

| | By the Watch | | True time | |
|---|---|---|---|---|
| | 11 10 ½ | —— | 11 00 ½ | ſenſibly decreaſed ... ½ of a digit |
| | 11 14 ½ | —— | 11 04 ½ | neareſt to 10 digits |
| | 11 25 | —— | 11 15 | full 9 digits, *i. e.* full 3 3 digits reſtor'd, or the Shadow rather within 9 digits |
| | 11 29 | —— | 11 19 | 8 ½ compleat |
| At | 11 34 ½ | —— | 11 24 ½ | full 8 digits |
| | 11 44 | —— | 11 34 | full 7 |
| | 11 48 | —— | 11 38 | full 6 ½ digits |
| | 11 52 ½ | —— | 11 42 ½ | juſt 6 |
| | 0 02 ½ P. M. | —— | 11 52 ½ | juſt 5 |
| | 0 13 | —— | 0 03 P.M. | full 4 |
| | 0 26 | —— | 0 16 | full 2 ½ |
| | 0 32 | —— | 0 22 | better than 2 |
| | 0 41 | —— | 0 31 | better than 1 |
| | 0 48 | —— | 0 38 | ended. |

Obſervations made after the Eclipſe was done, of the Sun's Altitude, in order to rectifie the Watch.

| | Time by the Watch | | Comp. Altit. | | True time. | | differ. |
|---|---|---|---|---|---|---|---|
| | h ′ ″ | | | | | | |
| | 3 31 30 | —— | 45 52 | —— | 3 21 36 | —— | 9 54 |
| | 36 15 | —— | 46 23 | —— | 26 16 | —— | 9 59 |
| At | 38 10 | P. M. | 46 45 | —— | 28 16 | —— | 9 54 |
| | 46 50 | —— | 48 19 | —— | 36 48 | —— | 10 02 |
| | 48 10 | —— | 48 30 | —— | 38 20 | —— | 9 50 |

Hence it appears, that the Watch went about 10 minutes too faſt during the whole Eclipſe, as we have all the way allowed.

So

So that the Eclipſe

| | h | |
|---|---|---|
| Began at | 9 | 14 Mane. |
| Ended at | 0 | 38 P. M. |
| Laſting in all | 3 | 24. |

Note, that in the Calculation, the Latitude of *Boſton* was allowed to be 42 . 2'5.

The ſecond is of a Lunar Eclipſe, that happen'd *Feb.* the 11th, 1700, in the evening, as follows.

The Moon roſe eclipſed, and the Horizon was ſo overcaſt, that I diſpair'd of having any obſervation; but at ½ an hour paſt 6 ſhe came from under the Cloud, and at 6 h 25' I had juſt a ſight of her, and judge her eclips'd about 5 digits, at

h

6 29 The Section equidiſtant from M. *Ætna* & Horminius.
32 Palus Maræotis begins to be ſeen.
34 ½ Palus Maræotis and Mons Apollonius ½ out.
37 ½ Palus Maræotis quite free, and Palus Maræotis and Palus Mæotis in the perpendicular.
42 ¾ The Shadow near an Inch from Palus Maræotis, Mons Horminius and Mons Hercules.
46 ¼ Palus Maræotis in the Nadir, and that part of Palus Mæotis to my right hand in the Prime Vertical.
57 The upper part of the Section is now, and has been for a long time in Inſula Major in Mare Caſpio (and the Section now perpendicular) and the lower part wheeling about from Palus Maræotis.
7 20 Mount Sinai firſt appears at 22' wholly free.
25 ½ Palus Maræotis and Mons Horminius near perpendicular.
43 The Eclipſe over in the Teleſcope, and at 49 to to the naked Eye.

My Clock was ſet by my Ring-Dial about 9 a Clock in the morning, as exactly as I could judge, and the ob-

ſervation was made with my 4½ foot Teleſcope, with all four Glaſſes in it.

The Obſervation of the Eclipſe of the Sun on the 27th of *November* 1703, was as follows.

At half an hour paſt 8 in the morning, I ſet my Clock exactly by my Ring-Dial, and at half an hour paſt 9 they nicely agreed, at

h
10 00 The Sun was not touch'd.
06 The Moon enter'd on the S S W Point as near as I could judge.
15 The Eclipſe was conſiderably advanc'd.
20 ſeem'd to be about half a digit eclipſed, rather more than leſs, and the Section to be a ſmall matter more Weſtwardly.
10 25 Much the ſame, and near the ſame point.
30 ſeem'd to be leſs.
33½ The middle of the Section nearer the S W, and the Diameter of the Section leſs every way.
37½ Much leſs and nearer the Weſt.
44½ It ended, and was juſt over, going off near the S W, ſo that all the while it was within a point or two of the place where it firſt came on, or between the S S W and the S W.

I judg'd when it was at the height, that the Chord of the eclipſed part was neareſt equal to the ſide of an inſcrib'd Decagon, or ſubtended about $\frac{1}{10}$ of the Periphery of the Sun's Disk.

I obſerv'd this Eclipſe with a Teleſcope of one joynt, 4 foot and a half in length, and had only 2 Glaſſes, ſo that it inverted the object; and I had a red Glaſs which ſuited it, ſo that I could ſcrew it in juſt before the Eye-Glaſs, and was not fain to hold it in my hand, as when I ob-

I obſerv'd the Sun's Altitude with the braſs Quadrant, which was a great convenience.

The laſt is an Obſervation of the Eclipſe of the Moon on *December* the 12, 1703 in the morning.
Time by the Clock.

h '
11 45 That part of the Moon's Disk near Alabaſtrinus, looks ſomewhat duskiſh, and the Eclipſe beginning to enter between Palus Maræotis and M. Porphyritis.
11 53 The true Shadow was well entred.
58 M. Porphyritis juſt cover'd.
12 03 ½ near 3 digits darkened.
7 ½ Mount Ætna begins.
9 ½ quite covered.
14 ½ Lacus Niger major and M. Sinai almoſt equidiſtant from the Section of the Shadow, Lacus Niger Major, being ſomewhat the nearer of the two.
18 ¼ Lacus Niger Major begins 19 ½ quite covered.
21 ¼ Mount Sinai begins.
21 ¾ Quite covered and the Moon about 6 digits eclipſed.
12 24 ½ Besbicus begins.
26 Quite covered.
28 ¾ Byſantium begins.
29 ½ Covered and Mount Horminius begins.
32 Apollonia begins.
33 Covered.
37 The Shadow equidiſtant from M. Corax and Mount Paropamiſus, or ſomewhat nearer to Mr Corax.
39 ½ between 9 and 10 digits eclipſed.
43 M. Corax begins.

h
12 44 ¾ Palus Mæotis begins, and at 45 ¾ the inner of M. Paropamiſus begins.
50 Palus Mæotis quite covered.
51 ½ The Moon not quite eclipſed.
52 Nor yet.
53 Nor yet.
54 Scarce.
54 ½ Quite Immerg'd and the Mora begins.
14 39 Preciſely, ſhe Emerg'd between Palus Maræotis and Mons Porphyritis.
42 Palus Maræotis begins.
43 Quite clear.
47 M. Porphyritis quite clear.
55 About 3 digits reſtor'd.
59 Mount Ætna begins.
15 02 That and Lacus Niger Major at the ſame time clear.
8 ½ Mount Sinai about half free.
9 ½ Quite free, and about 6 digits reſtored.
15 Besbicus free
19 ¼ Byſantium free.
29 ½ About 9 digits ſeem'd to be reſtor'd.
30 ¼ Mons Herculis free.
32 ¾ Palus Mæotis begins.
38 ½ Quite free.
41 ½ Inſula Major in Mare Caſpio free, and in the middle of the Section.
42 ½ Not yet wholly clear.
45 Fully over in the Teleſcope, tho a kind of a Smoak remained ſome little after to the naked Eye.

In order to the adjuſting of the time, I ſet my Clock with the greateſt exactneſs I could the morning preceding, both from my Ring-Dial and the riſing of the Sun, which I very narrowly watch'd and obſerved, and found it to agree

agree with the Sun's ſetting the following evening; ſo that it went all the time the Eclipſe was, very ſteadily and regularly; but for the greater Certainty and Satisfaction, I took the Altitudes of the following Stars with the Braſs Quadrant with Teleſcope Sights out of my Chamber Window, the lowneſs whereof would not permit me to take them, when they were at all higher elevated.

* in dextro humero Orionis.

| By the Watch | Comp. Alt. | | Differ. | |
|---|---|---|---|---|
| h | | h ′ ″ | ′ ″ | |
| 6 15 | 78 18 | 6 13 40 | 1 20 | So that my Clock went by theſe Obſervations near-eſt 1′ too faſt. |
| 6 21½ | 77 03 | 6 20 28 | 1 02 | |
| 26¼ | 76 11 | 6 25 08 | 1 07 | |
| Procyon | | | | |
| 8 9¼ | 77 20 | 8 08 04 | 1 11 | |
| 14½ | 76 20 | 8 13 32 | 0 58 | |
| 21 | 75 13 | 8 19 36 | 1 24 | |
| Re- 10 8½ | 77 46 | 10 07 18 | 1 12 | |
| gulus 17¼ | 76 11 | 10 15 58 | 1 17 | |

This is all the account that can be given at preſent, by

*Sir,*

*Your Humble Servant,*

T. B

I had the good fortune (by the aſſiſtance of ſome ingenious Friends in *Finch-Lane*, near the *Exchange*) to make ſome few obſervations of the laſt, of *December* the 11th, 1704 (of which I gave an account to this Honourable Society ſome time ſince) as follows.

The Heavens being cloudy moſt part of the night, it was 35′ after 4 in the morning following, before I could

could perceive that the Moon was eclipſed, and then as near as I could judge, ſhe had been ſo about 3 or 4 minutes at moſt, from whence we may conclude it began at *London* about 31 or 32 minutes after 4 the ſame morning.

Mr *Brattle* found, that at 44 minutes after 11 at Night, part of the Moon's Disk look'd ſomewhat duskiſh, and that at 52 minutes, the Shadow was well entred, *ſo that from hence, as well as from a Compariſon of the Ingreſs and Egreſs of the principol Spots, it probably began there about 49 minutes after* 11, *whence it follows, that* Cambridge *in* New England *lies* $4^h\ 4'\ 2\frac{1}{2}''$, *or* 70 37′ *to the Weſtward of the Meridian of* London.

I happen'd to ſee the Moon the ſame morning at 35 minutes after 5, when ſhe wanted at moſt but 3 minutes of being totally eclipſed; ſo that at *London* ſhe immerg'd at 38 minutes paſt 5.

Mr *Brattle* ſaw her immerge exactly at 54 minutes after 12, whence it follows, that the difference of the Meridians found by comparing theſe obſervations, is $4\text{ h }43'\frac{1}{2}''$, or $70^o\ 52'$ agreeing very well with the former; ſo that by taking a mean between them, the difference of Longitude of the 2 Places is 4h 43′, or 70° 45′.

I ſaw no more of the Eclipſe that morning, and ſhould be very glad to meet with ſome other obſervations to confirm theſe, but their mutual agreement gives great reaſon to believe that the Deductions are good, and may be rely'd upon.

IV. *Ob-*